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NASA SimLabs News

NEW
[Airport
Workshop](#)

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<http://www.simlabs.arc.nasa.gov>

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Newsletter

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Welcome New Subscribers!

If you are receiving this newsletter for the first time, SimLabs News is a quarterly publication reviewing current projects at the NASA Ames Simulation Laboratories (SimLabs). NASA [SimLabs](#) is comprised of three unique Flight Simulators, an Air Traffic Control radar simulator and a high fidelity Air Traffic Control Tower simulator. The facilities support government as well as private industry in a wide array of applications. To find out more, read on!

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1. [2006 FAA/NASA/Industry Airport Planning Workshop](#)
"Technology - Smart Solutions for Airport Capacity."
 2. [What is Virtual Airspace Simulation Technology \(VAST\)?](#)
VAST will enable unprecedented simulation evaluations of the Next Generation Air Transportation System (NGATS) concepts in support of the Joint Planning and Development Office (JPDO).
 3. [Virtual Airspace Simulation Technology \(VAST\) Answers Challenge for Advanced Air Traffic Management \(ATM\) Research](#)
VAST flexibility supports research across multiple domains.
 4. [SimLabs Air Traffic Control Lab Gets An Upgrade](#)
New equipment will provide enhanced ATC radar simulation.
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1. 2006 FAA/NASA/Industry Airport Planning Workshop

Mark your calendars for the [FAA/NASA/Industry Airport Planning Workshop](#) to be held September 12-13, 2006 at NASA Ames Research Center, Moffett Field, CA. We are privileged to announce an Executive Steering Committee of aviation industry visionaries to guide our development of the Workshop.

The theme this year is: "Technology - Smart Solutions for Airport Capacity." Bring your airport challenges to brainstorming discussions at breakouts on airside terminal, and landside. Discover how advances in Information Technology, Modeling and Simulation promote safe and efficient designs and cooperation among airport stakeholders. Discuss emerging technologies and strategies for introducing them at your airport. Visit the workshop website http://www.simlabs.arc.nasa.gov/airport_workshop.html for periodic updates.



2005 NASA/Industry Airport Planning Workshop

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2. VAST to support NGATS and JPDO

The Virtual Airspace Simulation Technology ([VAST](#)) tool was developed by NASA to provide a unique human-in-the-loop real-time simulation environment to evaluate current and future airspace operations and concepts. VAST leverages existing facilities and models, and has added capabilities and components that support distributed Air Traffic Management (ATM) simulation creating a new Gate-to-Gate simulation capability. VAST provides revolutionary capabilities to evaluate human factors issues for air traffic management and control concepts, both system-wide and in localized segments of the National Airspace System (NAS). It has also proven its value to study ATM safety, capacity and efficiency.

VAST is currently adding capabilities specifically to support NGATS (Next Generation Air Transportation System) and JPDO (Joint Planning and Development Office) concepts.

VAST has made innovations in many areas of distributed simulation.

- Provides software that requires minimal customization for rapid and cost effective integration of new facilities and components
- Makes maximum use of existing capabilities with minimum changes required to legacy and proprietary code
- Offers flexible and configurable components that support housekeeping and data collection/distribution for distributed ATM simulation, which can be integrated as needed for any research project
- Uses an easily changeable data communications infrastructure that can be quickly customized for different ATM research projects, and is adaptable to research in other areas

as well

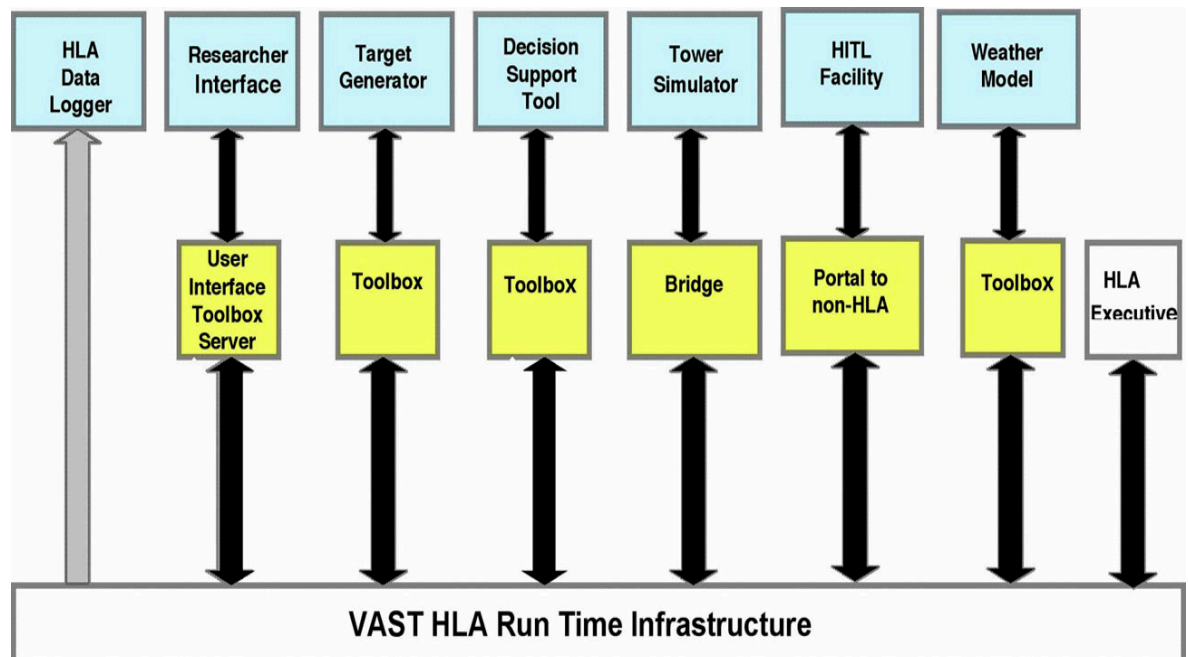
VAST's innovative architecture provides capabilities beyond those generally available.

- Allows rapid prototyping of new concepts for early simulation assessment of human factors issues. This allows research results to guide the design phase
- Allows all stakeholders to view a realistic representation of the concept. Research participants can include controllers, pilots, and airline and airport management
- Can simulate traffic levels well beyond the current NAS capacity
- Has integrated other NASA research software into the VAST environment
- Makes available source code or executables on request

The VAST architecture is based on DoD High Level Architecture (HLA). The HLA implementation has been customized for support of distributed ATM simulations.

VAST's innovative architecture allows for rapid and cost effective integration of new facilities, models, and concepts. Instead of publishing an interface standard and requiring other components to conform if they want to participate, or creating a single purpose interface with limited reusability, VAST has taken another approach to the interconnection of divergent simulation assets. VAST uses a Toolbox to connect components to the simulation environment. The Toolbox provides a template for integrating components with much of the code being reusable for any application. Toolboxes have been developed for components that have existing non-HLA interfaces, and can bridge between HLA federations with different Federated Object Models (FOM) or Run Time Infrastructure (RTI) implementations. The high degree of reusability of the code and the ease of customizing Toolboxes means significantly lower development and integration time, cost, and risk when adding a capability to the environment.

VAST allows researchers to integrate multiple technologies, models, or concepts that cross ATM domains into one simulation. The boundaries and interactions between technologies or concepts can be examined in real-time.



VAST Architecture

VAST has developed valuable software components that support distributed ATM simulations. Here is a partial list of the simulation services VAST provides:

- The Airspace Traffic Generator (ATG) generates and controls aircraft in a simulation. It can be used alone or in conjunction with other target generators or facilities. The ATG supports both airborne and ground operations. Aircraft can be controlled through pseudo-pilot interfaces or via datalink messaging, enabling the ATG to support simulations of current operations, or ATM concepts for 2020 and beyond. The ATG can be used Gate-to-Gate or for research in specific segments of the NAS.

Using the ATG to support NAS segments that do not require research participants can reduce the cost of running real time simulations. The ATG can also substitute for humans to close the loop during simulation development and testing.

- The Object Handoff Manager (OHM) controls the transfer of ownership of aircraft in the simulation between multiple facilities or components as targets move through the airspace. The OHM is configurable so it can support any mix of facilities or domains.
- HLA-based data collection and flexible post-processing capabilities fuse disparate data sources from across the distributed simulation environment.
- VAST provides user displays that allow remote observation of the entire simulated airspace for situational awareness, simulation observation, and debugging.

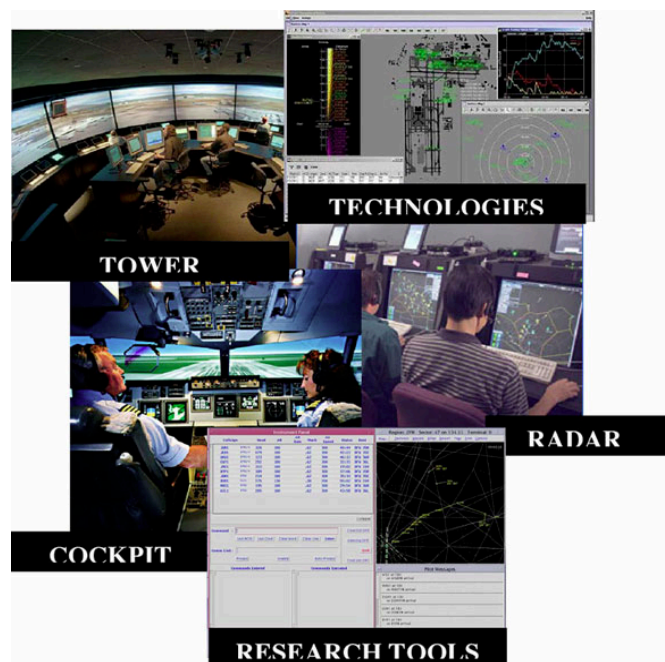
The tools are validated and available for current research projects as well. Imagine what VAST can do for you!

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3. VAST Answers Challenge for Advanced ATM Research

The [VAMS](#) (Virtual Airspace Modeling and Simulation) project funded development of the [VAST](#) real time simulation environment to support human factors research on advanced Air Traffic Management (ATM) concepts. Advanced ATM concepts involve radical changes, envisioning a NAS (National Airspace System) with major departures from current day operations and technology. To support research for these advanced concepts, a simulation environment must support:

- Revolutionary modifications to the national air transportation system
- A very flexible and adaptable simulation environment
- Multi-domain and multi-facility research
- System-level studies to evaluate human factors issues



Advanced ATM concepts involve major changes to the roles and responsibilities of humans and automation. Some of the areas of research include:

- Completely revised decision support tools and automation
- Collaborative decision making
- New business models
- Next generation communications technology and information sharing
- Interfaces between new automation concepts and between new automation and current technology and operations

VAST has answered the challenge and produced an environment that supports current day as well as advanced ATM research.

VAST's distributed simulation network includes a large number of state-of-the-art human-in-the-loop simulation facilities where research participants can be immersed in the experience of the new NAS. It supports all air traffic control domains, so controllers from the ramp, to the Tower, to en route, and back can participate. Pilots can fly in multiple high fidelity flight simulators and interact with controllers. In addition, other major stakeholders, such as airlines and airports, can participate in the real time simulation of strategic planning and Airline Operations Centers. VAST can provide a gate-to-gate simulation environment or just the portions of the airspace necessary for your research.

VAST provides software to enable the transfer of control of aircraft between different facilities, providing true distribution of the simulation across diverse facilities and models. One facility does not just see targets from other facilities, but control over the characteristics and attributes of a flight can be transferred to the appropriate software model as the flight moves from one flight phase to another. This enables the researcher to use the best research environment available and apply different levels of fidelity to the different domains being simulated. Using lower fidelity components where high fidelity facilities are not needed saves money and development time, and using automated components to stand in for facilities during simulation development reduces the need for facility time.

NASA is integrating existing ATM research tools such as Surface Management System (SMS), and Center-TRACON Automation System ([CTAS](#)) into the VAST environment. The availability of these tools offers an enriched research environment to the user.

In addition to being a premier tool for human factors research, the VAST environment has been used to study safety, efficiency, and capacity ATM issues. Customers and collaborators have included airports, the FAA, and controller and pilot unions. VAST is extremely flexible, and has even been used for simulations in arenas other than ATM research such as UAV (Unmanned Air Vehicle) control, and training.

NASA is always seeking new partners for collaboration on distributed real-time simulation. The VAST team is currently working with the FAA Tech Center in New Jersey, and with the AviationSimNet group

VAST and SimLabs will be working on the following experiments:

- Surface Operations Automation Research ([SOAR](#)) experiment – Summer '06
This experiment will focus on the human factors issues associated with a highly automated surface operations decision support tool. This tool is designed to support operations in the year 2020 and beyond.
- SOAR + Terminal Area Capacity Enhancement Concept (TACEC) experiment – Fall '07
This experiment will combine the SOAR concept with the TACEC in a human factors real time experiment. SOAR provides automation tools for the Tower and the cockpit to

improve airport surface operations, and TACEC for Approach and Departure controllers and the cockpit to improve airport capacity in bad weather. This experiment will enable researchers to look at the two concepts, the interface between them, and the changed roles and responsibilities of pilots and controllers.

VAST is proven through research and validation, and available to meet your research needs. For further information contact Debbi Ballinger at Debbi.Ballinger@nasa.gov or 650-604-0634, or visit the VAMS web site at <http://vams.arc.nasa.gov/>.

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4. SimLabs Air Traffic Control Lab Gets An Upgrade

SimLabs Crew Vehicle System Research Facility's (CVSRF) [Radar Air Traffic Control \(ATC\) Lab](#) is being upgraded. The upgraded radar ATC lab will provide a flexible research environment making it better suited to accommodate research activities now being developed by NASA and the FAA. Research related to advanced air traffic management automation tools, simulation of new airspace operations, procedural changes, and noise studies may be conducted with higher fidelity than ever.

The FAA provided controller displays and consoles to the radar ATC lab without cost. The 28-inch displays are the most widely used controller displays in FAA terminal and en route air traffic control facilities. The displays and associated new display consoles will replace 17- and 18-inch computer monitors that have previously been used as controller radar displays. The addition of actual FAA displays and consoles will greatly improve the fidelity of the radar lab.



Controller Displays

Currently, the most appropriate configuration for the lab is being considered. These displays may be used as six terminal (Terminal Radar Approach Control (TRACON)) positions, three en route (Air Route Traffic Control Center (ARTCC)) positions or a combination of the two types of positions. Six additional displays are available for future use and can provide capability to enlarge the en route and approach control areas simultaneously.

The [CVSRF](#) ATC Lab is a unique radar lab within NASA and the FAA because it has the ability to be connected with all the facilities within [SimLabs](#) (the B-747-400 Simulator, Advanced Concept Flight Simulators and the [FutureFlight Central](#) control tower simulator). This connectivity provides researchers with gate-to-gate flight simulation capabilities. Discussions are

being held with FAA training personnel to see if the lab could be used to help expedite or enhance post-academy controller training.

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5. Upcoming Events

NASA SimLabs will be participating in the following upcoming conferences and events. If you are attending any of these events, please look us up.

- 78th Annual AAAE Conference and Exposition
April 23-26, 2006
San Diego, CA

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6. Thinking of Doing Business with NASA SimLabs?

For more information on what we can do for your needs, contact:

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